Daily measurements were examined for consistency and again the EPID and Starcheck performed similarly, with comparable standard deviations, as shown in Table 1.

	Transverse symmetry (%)			Field size X (cm)			Slope (%/mm) / Energy (%)		
Date	EPID	Starcheck	QA3	EPID	Starcheck	QA3	EPID	Starcheck	QA3
15/09/2015	0.5	-	0.04	19.92	-	20.01	0.29	-	107.2
18/09/2015	0.24	-	0.04	19.91	-	20.06	0.29	-	105.9
21/09/2015	0.46	-	0.21	19.91	-	20.01	0.29	-	106.6
23/09/2015	0.36	0.29	0.44	19.91	19.91	20.02	0.29	0.3	106.3
25/09/2015	0.42	0.32	0.33	19.93	19.87	20.05	0.29	0.3	106.6
29/09/2015	0.57	0.33	0.11	19.91	19.94	20.01	0.29	0.3	105.7
08/10/2015	0.42	0.34	0.09	19.91	19.92	20.24	0.29	0.3	104.7
12/10/2015	0.42	0.37	0.09	19.91	19.93	20.24	0.29	0.3	105.4
Std Deviation	0.097	0.029	0.147	0.007	0.027	0.101	0.000	0.000	0.791

Table 1 – Table showing the daily measurements and calculated standard deviations for all three devices taken for Symmetry, Fields size and Energy.

Conclusion: Our results show that for FFF QA measurements such as field size and symmetry, using the EPID is a viable alternative to other QA devices. The EPID performs particularly well on geometric measurements, as it is able to detect small changes in positon (~1mm) with good consistency. This is to be expected due to its high resolution when compared to the other QA devices used (EPID 0.34mm, Starcheck 3mm, QA3 5mm). Therefore the EPID could potentially be used for a wider range of QC measurements with a focus on geometric accuracy, such as MLC positional QA.

References [1] Fogliata, A., Garcia, R., et Al (2012). Definition of parameters for quality assurance of flattening filter free (FFF) photon beams in radiation therapy. *Med. Phys.*, 39(10), p.6455.

PO-0817

Characteristics and performance of the first commercial MLC for a robotic delivery system

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Purpose or Objective: To assess characteristics and performance of the "InciseTM" MLC (41 leaf pairs, 2.5mm width, FFF linac) mounted on the robotic SRS/SBRT platform "Cyberknife M6TM" in a pre-clinical 5 months test period and to ensure quality of clinical treatments.

Material and Methods: Beam properties were measured with unshielded diodes and EBT3 film. Bayouth tests for leaf / bank position accuracy were performed in standard (A/P) and clinically relevant non-standard positions, before and after exercising the MLC for 10+ minutes. Total system accuracy was assessed in End-to-End tests. Delivered dose was verified with EBT3 film for exemplary and clinical plans. Stability over time was evaluated in Picket-Fence- and adapted Winston-Lutz-tests (AQA) for different collimator angles.

Results: Penumbrae (80-20%, with 100%=2*dose at inflection point; SAD 80cm; 15mm depth) parallel/perpendicular to leaf motion ranged from 2.7/2.2mm for the smallest (0.76x0.75cm2) to 3.7/3.6mm for larger (8.26x8.25cm2) square fields. MLC penumbrae are slightly wider than penumbrae fixed cones (2.1 to 2.8mm for 5 to 60 mm cones). Interleaf leakage was <0.5%. Average leaf position offsets were ≤0.2mm in 14 standard A/P Bayouth tests and≤0.6mm in 8 non-standard direction tests. Pre-test MLC exercise slightly increased jaggedness (range +/-0.3mm vs. +/-0.5mm) and allowed to identify one malfunctioning leaf motor. Total system accuracy with MLC was 0.39+/-0.06mm in 6 End-to-End tests. Delivered dose showed good agreement with calculated dose (typically Gamma(3%,3mm)<1 for >95% of pixels with D > 0.1 Dmax). Picket-Fence and AQA showed no adverse trends (> 1 yr).

Conclusion: The InciseTM MLC for CyberKnife M6TM displays high mechanical stability and accurate dose delivery. The specific CK geometry and performance after exercise demand dedicated QA measures.

PO-0818

Multicentre small field measurements using a new plastic scintillator detector

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Purpose or Objective: Small field dosimetry standardization is fundamental to ensure that different institutions deliver comparable and consistent radiation doses to their patients. The current study presents a multicenter small field evaluation including: Tissue Phantom Ratio (TPR), dose profiles FWHM and penumbra, and output factors (OF), for the two major linear accelerator manufacturers and different X-ray energies.

Material and Methods: The project enrolled 31 Italian centers, 15 equipped with Elekta Linacs and 16 with Varian Linacs. Each center performed TPR measurement, in-plane and cross-plane dose profile of 0.8x0.8cm2 field and OFs measurements for field sizes ranging from 0.6x0.6 cm2 to 10x10 cm2 defined by both secondary jaws and MLC. Set-up conditions were: 10cm depth in water phantom at SSD 90cm. Measurements were performed using the new Exradin W1 plastic scintillator detector (Standard Imaging). The two canals SuperMAX electrometer (Standard Imaging) to automatically correct for Cherenkov radiation was used. Two identical W1 were used to speed up the data collection.

Results: The analysis included 13 Varian and 13 Elekta centers; 7 centers were excluded due to a condenser problem in an electrometer. As reported in Table 1 for the two most representative linac models, TPR measurements showed standard deviations (SD)=0.6%; penumbra values of dose profiles showed SD=0.5mm, while FWHM measurements showed a greater variability. As illustrated in Figure 1, OF measurements showed standard deviations within 1.5% for field size greater than 2x2 cm2; for field size less than 2x2 cm2 measurements' variability increases with decreasing field size. OF values show no dependence from the effective field size.

Table 1. TPR, FWHM and penumbra values measured with W1 PSD for the two most representative linacs of the multicenter study

Manufacturer	Model	Energy	TPR	FWHM (mm)		Penumbra (mm)	
Varian	Clinac 2100	6	0.670±0.003	8.1±0.4	7.9±0.5	2.3±0.4	2.3±0.2
Elekta	Agility	6	0.688±0.004	9.3±0.4	7.9±0.5	4.2±0.4	2.7±0.2